

to monitor pulsed digital output from a tachometer or as general-purpose frequency counters. Five digital-input lines were originally intended to monitor digital voltage-identification lines. You can use them for general-purpose input lines, whose inputs can sense high- or low-level status signals from digital sensors or from alarm channels. In Figure 1, the

DAS monitors a thermostatic sensor. The DAS handles control and reading functions via a simple two-wire SMBus or an I²C interface to a μ P or μ C. If a dedicated I²C controller is not available, then you can use a port "bit-banging" technique. Easy expansion is also possible by selecting a different device address. Using a different device-address bus entails

no additional communication lines, because multiple devices can reside on the same bus.

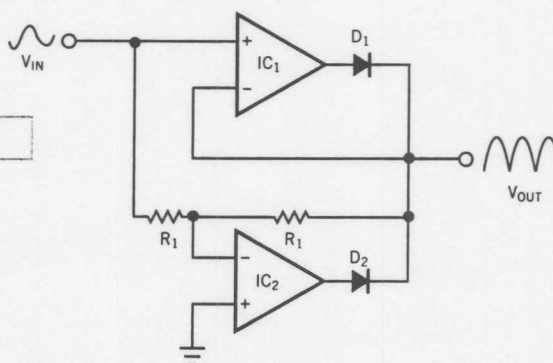
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Full-wave rectifier has programmable gain

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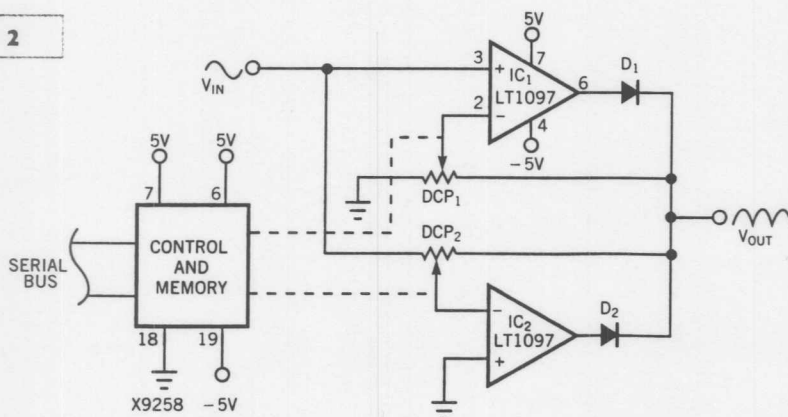
THE TRADITIONAL approach to the design of a full-wave rectifier (Figure 1) is to set the gains of IC₁ and IC₂ to 1 and use the steering diodes D₁ and D₂ to sum the sinusoidal half-cycles of the input to form the rectified output. For the positive half-cycle of the input signal, IC₁ is a noninverting amplifier with a gain of 1. For the negative half-cycle of the input signal, IC₂ is an inverting amplifier with a gain of -1. This full-wave-rectifier circuit often com-

Figure 1



This full-wave-rectifier circuit has a fixed gain of 1.

Figure 2



You can program the gain of this full-wave rectifier from unity to 255.

bins with a lowpass filter to form a low-cost ac/dc converter. If you need a full-wave rectifier with amplification, the combination of these two functions in one circuit can provide savings in cost, component count, and board space. The circuit in Figure 2 combines rectification and programmable amplification. The two 256-tap Xicor digitally controlled potentiometers, DCP₁ and DCP₂, control the gains of the noninverting amplifier, IC₁, and the inverting amplifier, IC₂, respectively. The gain of IC₁ is $G_1 = 255/P_1$, where P_1 ($0 \leq P_1 \leq 255$) is the programmed decimal value of DCP₁. Similarly, the gain of IC₂ is $G_2 = -(255 - P_2)/P_2$. The performance of this circuit takes advantage of the resistor matching inherent in the digital potentiometers. The measured data falls within 2% of calculated values.

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